

Calcium Education Sheets



Calcium is the 5th most abundant element in the Earth's crust and Chalk / Limestone forms 20% of the World's sedimentary rock. The word calcium is derived from the latin "calx", meaning lime. It was discovered early in the history of civilised man and there are references to lime in both Egyptian and Roman times, in fact as far back as the first century.

Lime is a generic term which can cover chalk, limestone, quicklime and hydrated lime. There are a number of synonyms for each material, some of which are given below:

Calcium Carbonate

CaCO₃ - Calcium Carbonate, Chalk, Limestone
Molecular Mass 100.09
Decomposes at 900 °C to form calcium oxide



Calcining (or burning) - This involves heating the chalk to approx. 1100 °C in a kiln
CaCO₃ + HEAT = CaO + CO₂



Calcium Oxide

CaO - Calcium Oxide, Quicklime, Burnt Lime
Molecular Mass 56.08
Melts at 2614 °C, boils at 2850 °C



Hydration (or slaking) - This involves adding water, which produces an exothermic reaction (gives out heat)
CaO + H₂O = Ca(OH)₂ + HEAT



Calcium Hydroxide

Ca(OH)₂ - Calcium Hydroxide, Slaked Lime, Hydrated Lime
Molecular Mass 74.09
Decomposes at 580 °C to form calcium oxide



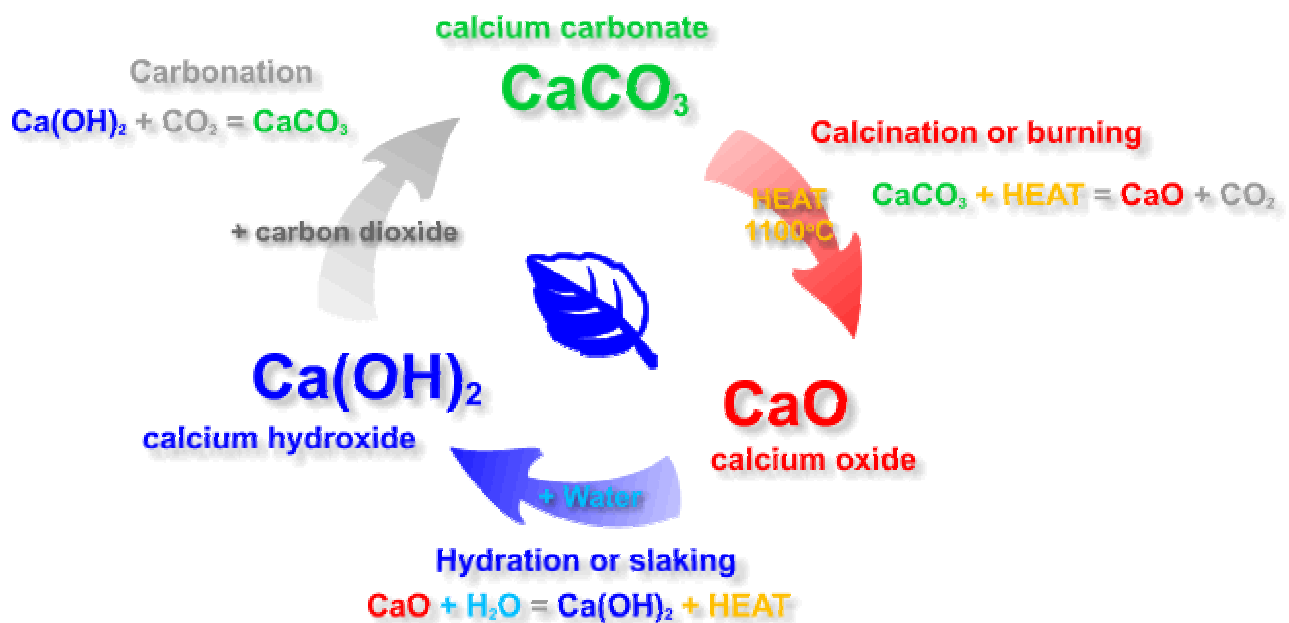
Carbonation - This involves reaction with carbon dioxide to return to chalk
Ca(OH)₂ + CO₂ = CaCO₃ + H₂O
(back to calcium carbonate)

The Calcium Cycle



The calcium cycle is one of nature's best known examples of chemistry. This classic series of chemical reactions is the basis for numerous applications, many of which affect our lives every day.

The diagram below illustrates how chalk (calcium carbonate) turns into burnt lime (quicklime or calcium oxide) after heating, then into hydrated lime (slaked lime or calcium hydroxide) after adding water and then back into chalk after it reacts with carbon dioxide from the air.



For further information on making lime, visit our lime production page at:

<http://www.singletonbirch.co.uk>

Applications of Lime



Here are some uses for **chalk** or limestone (also known as calcium carbonate):

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|-------------------|---|
| Agriculture | - chalk is used to adjust the pH of soil in order to improve crop yields. |
| Iron manufacture | - chalk is used as a flux and aids in the removal of impurities as slag. |
| Civil engineering | - chalk is used in construction. |

Here are some uses for **quicklime** (also known as burnt lime or calcium oxide):

- | | |
|-------------------------|--|
| Biosolids treatment | - quicklime is used to raise the temperature and pH of sewage and other sludges, which kills pathogens etc. |
| Aerated concrete blocks | - quicklime is used to provide an alkaline slurry and temperature rise. |
| Soil treatment | - quicklime is used to provide heat and react with excess moisture, which dries out wet ground. Calcium will then react with clay minerals to produce a cement like material with improved strength. |
| Slaked lime production | - quicklime is slaked to produce slaked lime in situ on many sites, due to the economies of scale, so most of the slaked lime uses are also quicklime uses. |

Here are some uses for **slaked lime** (also known as hydrated lime or calcium hydroxide):

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|--------------------------|---|
| Drinking water treatment | - slaked lime is used to remove temporary hardness. |
| Lime sand mortar | - slaked lime is used to give the mortar plasticity and make it less brittle. |
| Acid neutralisation | - slaked lime is used to adjust the pH of acids. |
| Effluent treatment | - slaked lime is used to precipitate out many soluble impurities, including acids and heavy metals. |
| Flue gas treatment | - slaked lime is used to precipitate out many gaseous impurities, including acids and heavy metals. |
| Leather processing | - slaked lime is used to de-hair and plump hides before the tanning process. |

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